

## **Supplement Performance**

By Anssi H. Manninen, MHS

### **Nutrient Timing**

#### ***The Fruit of Cutting-Edge Scientific Insights into Exercise Metabolism, Physiology and Nutrition***

*“Sports nutrition is skewed toward two ends of the information spectrum. At one end are the nutritionists and “nutritional experts” who advocate a 1960s approach to sports nutrition. Their advice consists mainly of paying attention to the food pyramid, eating lots of leafy vegetables and trying to control fat intake. According to this approach, you should get all the nutrients you need by following a healthy diet... For many nutrition traditionalists, good scientific research ended around 1980. They generally fail to incorporate in their programs some of the landmark studies showing how nutrition could have improved the sports performances of the last two decades.”*

—Drs. John Ivy and Robert Portman

*Nutrient Timing: The Future of Sports Nutrition*

Sports supplements and ergogenic aids, or substances that enhance exercise performance, are as ancient as sports themselves. Sports nutrition fads are known from ca. 500-400 B.C., when athletes and warriors used products such as deer liver and lion heart to impart certain benefits, hoping that consumption would produce bravery, speed or strength.<sup>12</sup>

According to a recent text entitled *Nutrient Timing: The Future of Sports Nutrition* by Drs. John Ivy and Robert Portman, nutrient timing is a revolutionary new system of exercise nutrition that will allow you to build more strength and lean muscle mass than ever before.<sup>1</sup> Authors stress that nutrient timing is not a commercial gimmick. Rather, they feel it's the fruit of cutting-edge scientific insights into exercise metabolism, physiology and nutrition. I agree. This book is based on *real* science. This article provides a review of supplementation strategies described in *Nutrient Timing*.

#### **Three Phases of the Nutrient Timing System**

According to Drs. Ivy and Portman, there are three phases of the Nutrient Timing System: 1) the Energy Phase; 2) the Anabolic Phase; and 3) the Growth Phase. The Energy Phase coincides with your workout, the Anabolic Phase is the 45-minute window following your workout and the Growth Phase extends from the end of the Anabolic Phase to the beginning of the next workout.

**[Table 1.1 from Ivy & Portman 2004 page 13 here]**

#### **Pre-Workout Supplementation**

Obviously, consumption of a carbohydrate-protein drink before a workout can raise both blood glucose and insulin levels. At the beginning of exercise, there

will be an increase in glucose uptake into the muscles for use as fuel. A second benefit is that consumption of a carbohydrate-protein drink immediately before exercise results in greater protein synthesis *after* exercise. A third potential benefit is that by raising the blood glucose level, you may reduce the rise in cortisol. Thus, Drs. Ivy and Portman suggest that nutrient supplementation immediately before exercise will not only improve your workout, but will also lay the groundwork for a faster recovery. They speculated that the ideal drink to consume before exercise should contain the following ingredients: high-glycemic carbohydrates, whey protein, leucine, vitamin C, vitamin E, sodium, potassium and magnesium.

### **Supplementation During Exercise**

During resistance exercise, cortisol levels can increase fivefold. This hormone is released from the adrenal glands when blood glucose (sugar) is low and during very intense exercise such as weightlifting. According to Drs. Ivy and Portman, cortisol is the reason many strength athletes reach a plateau. Also, cortisol lowers the concentration and activities of many of the important immune cells that fight infection. Fortunately, blood cortisol levels can be regulated to a significant degree by controlling glucose availability.

The authors feel that strength athletes who ignore the benefits of nutrient supplementation during their workouts place themselves at a greater risk of experiencing the immune-suppressive effects of cortisol. Further, they recommend that the ratio of carbohydrate to protein be approximately three to four grams of carbohydrate to one gram of protein, as this formulation is highly digestible.

However, while carbohydrate feeding during exercise appears to be effective in minimizing some of the immune perturbations associated with prolonged continuous, strenuous exercise, it appears less effective for less demanding exercise of an intermittent nature.<sup>2</sup> Also, there is no evidence that the beneficial effect of feeding carbohydrates on immune responses to exercise translates into a reduced incidence of upper respiratory tract infections.<sup>2</sup>

**[Insert Figure 4.3 from Ivy & Portman 2004 page 53 here]**

### **Post-Workout Supplementation**

According to Drs. Ivy and Portman, the Anabolic Phase is the most critical phase of the Nutrient Timing System. Following a workout, the muscle machinery is primarily in a catabolic state. However, it's primed to switch into an anabolic mode if the right stimuli are provided. As pointed out by the authors, during the 45-minute period post-exercise, muscle cells are acutely sensitive to the anabolic stimulus of insulin.

Clearly, consumption of nutrients during the Anabolic Phase can help replenish glycogen stores faster, improve muscle mass and even speed up fat oxidation (burning). The authors speculated that the ideal nutrient composition of supplements for the Anabolic Phase is as follows: high-glycemic carbohydrates, whey protein, leucine, glutamine, vitamin C and vitamin E. Based on the latest studies, they recommended a 3:1 to 4:1 ratio of carbohydrates to protein; in other words, three to four grams of carbohydrate per gram of protein.

Drs. Ivy and Portman feel that glutamine is an excellent candidate for inclusion in a post-workout drink because glutamine stores are depleted following heavy exercise and glutamine has been shown to play an important role in maintaining a healthy immune system. However, in a recent study by Dr. L. van Loon and colleagues, the free glutamine hardly influenced plasma glutamine levels.<sup>3</sup> Nevertheless, Dr. L.M. Castell and co-workers have provided evidence that an oral glutamine supplement (five grams) consumed immediately after and two hours after a marathon reduces the incidence of upper respiratory tract infections.<sup>4</sup> However, it is unlikely this amount of glutamine supplementation could actually have prevented the post-exercise fall in the plasma (blood) glutamine concentration.<sup>2</sup>

Interestingly, Dr. R.A. Bassit and co-workers reported that supplementation of branched amino acids (BCAA) (six grams per day for 15 days) prevented the post-exercise fall in plasma glutamine concentration.<sup>5</sup> Finally, the authors feel that strength athletes should use supplemental vitamins C and E. The evidence appears to suggest that there may be a reduction in signs of muscle damage after antioxidant supplementation, but there is no evidence for beneficial effect on performance.<sup>11</sup>

### **Nutrient Activators**

Nutrient activation takes place when one nutrient helps another nutrient perform its job more efficiently. According to Drs. Ivy and Portman, the most important nutrient activator in relation to protein is carbohydrate. Obviously, this connection is mediated through insulin, a peptide hormone produced by the beta cells of the pancreas (see my article in April, 2004 issue of MD). As the authors point out, insulin not only stimulates the transport of amino acids into the muscle, it also activates key elements of protein synthetic machinery. The effect of combined carbohydrate-protein supplementation is greater insulin levels. Also, the authors feel arginine is an excellent stimulator of insulin. However, the study by Dr. van Loon and colleagues shows clearly that oral ingestion of large amounts of free arginine is *not* an effective means of increasing plasma (blood) insulin concentrations.

According to Drs. Ivy and Portman, leucine in particular is one of the most potent nutrient activators in relation to muscle growth. Indeed, anabolic effects of leucine on muscle protein have been reported for over 20 years. However, only recently have researchers begun to understand and integrate the overall metabolic roles of this amino acid. Leucine participates in metabolism in diverse ways including 1) as a substrate for protein synthesis; 2) as a fuel; and 3) as a metabolic signal.<sup>6</sup>

Studies evaluating changes in protein synthesis after exercise consistently report post-exercise anabolic responses enhanced by food intake. Interestingly, recent work suggests that the anabolic response is associated with the signaling role of leucine. In fact, Dr. Donald Layman, a world leader in this area, feels it is now clear that the stimulatory effect of the meal on protein synthesis is produced by increased muscle levels of leucine.<sup>6</sup> For more information on leucine and protein synthesis, see Dr. Layman's excellent review in the *Canadian Journal of Applied Physiology*.<sup>6</sup>

## **The Right Macronutrients**

Many bodybuilders avoid soy protein because it contains phytoestrogens, but this does not automatically mean phytoestrogens reduce testosterone levels and inhibit muscle growth. According to the authors, there is no evidence whatsoever that this is the case. However, Dr. R.C. Habito and co-workers performed a randomized crossover study of 42 men with a mean age of 45.7 years who consumed 150 grams of lean meat or 290 grams of tofu daily for four weeks.<sup>7</sup> Blood concentrations of estradiol, testosterone and dihydrotestosterone did not differ between the two diets. The mean testosterone-estradiol ratio was 10 percent lower, sex hormone-binding globulin was nine percent higher and the free androgen index was seven percent lower after tofu consumption.

However, this slight reduction in androgenic activity was not confirmed by Dr. Nagata and colleagues, who reported a parallel-arm study of 34 men with a mean age of 32.4 years, one-half of whom consumed an average of 343 milliliters soymilk daily for two months.<sup>8</sup> Blood concentrations of estradiol, total and free testosterone and sex hormone-binding globulin did not differ between the groups. These results are generally consistent with those of Dr. J.H. Mitchell and co-workers who found no changes in blood concentrations of estradiol, testosterone, follicle-stimulating hormone or luteinizing hormone in men consuming a tablet containing 40 milligrams per day of soy isoflavones.<sup>9</sup> In summary, there may be small effects of soy consumption on steroid hormones.<sup>10</sup>

Drs. Ivy and Poortman claim a hydrolysate is a protein that has been broken down into its constituent amino acids. However, this is not the case. Protein can be hydrolyzed (broken into smaller pieces) by enzymes, producing *small chains* of amino acids called peptides. This process mimics our own digestive actions, thus making it an ideal way to process protein. Indeed, several studies have shown that protein hydrolysates are absorbed more rapidly than free-form amino acids and much more rapidly than intact protein supplements or whole foods. This is a desirable trait for serious gym rats who wish to maximize amino acid delivery to muscle immediately after exercise.

## **Bottom Line**

*Nutrient Timing: The Future of Sports Nutrition* is easy to read and provides the latest scientific facts on nutrient timing to build more lean muscle mass and strength. As such, it's a must-read for serious bodybuilders. *Nutrient Timing* is available at Barnes & Noble, Amazon.com and GNC stores.

## **About the Authors**

John Ivy, PhD, is a professor and head of the department of kinesiology and health education at the University of Texas. Dr. Ivy is a world-renowned expert on the role of nutrition on exercise performance. He has published more than 300 research papers and review articles.

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